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Notes on *Veronica* Sect. Beccabunga (Scrophulariaceae) Found in Yunnan Province, China

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Three types of plants which belong to *Veronica* Sect. Beccabunga (Scrophulariaceae) were observed in northwestern Yunnan Province, China. The first one with 2n = 36 (tetraploid), found in high altitudes is considered to be *Veronica anagallis-aquatica* L. The second one with 2n = 54 (hexaploid), found in low altitudes is considered to be *Veronica undulata* Wallich. The chromosome number of 2n = 54 is documented for the first time from China. The third one with 2n = 45 was collected at the waterside of the brook in the rice field, Lijiang. The long raceme was composed of many shriveled calyxes and almost sterile capsules. It is considered to be an interspecific hybrid between *Veronica anagallis-aquatica* L. and *Veronica undulata* Wallich, i.e., *Veronica* × *myriantha* Tos. Tanaka. A natural hybrid is newly recorded from China.

Key words: *Veronica*, Sect. Beccabunga, Scrophularia ceae, chromosome number, China

Veronica L. (Scrophulariaceae) is a large genus comprising more than 200 species, widely distributed in the northern temperate zone, especially in the Old World (Hitchcock et al. 1959). *Veronica anagallis-aquatica* L., the most common species in *Veronica* Sect. Beccabunga, is almost cosmopolitan with the vast distribution range (Hartl 1975). *Veronica undulata* Wallich resembles *V. anagallis-aquatica* in appearance and occurs widely in East and Southeast Asia (Yamazaki 1957, Tsoon and Hong 1979). Concerning *Veronica* Sect. Beccabunga found in Japan, Tanaka and Noguchi (1994) reviewed the taxonomic problem and Tanaka (1995) described a new interspecific hybrid. In order to investigate the morphology and cytology of this group in China, we carried out a field survey in northwestern Yunnan Province.

Materials and Methods

The specimens examined in this study were collected from northwestern Yunnan Province, China, during our field survey in 1996. Their localities and habitats are presented in Table 1. Voucher specimens are deposited in the Kunming Institute of Botany (KUN), China, and Makino Herbarium, Tokyo Metropolitan University (MAK), Japan.

Somatic chromosomes were observed in

meristematic cells of root tips. The root tips were pretreated in the field with 2mM 8-hydroxyquinoline solution for 4 hours. After fixation in 3 : 1 mixture of ethanol and acetic acid, they were macerated in 1N HCl for 30 sec at 60°C, and then stained with 2 % aceto-orcein solution for overnight. Subsequently, they were squashed in the standard way and observed using a light microscope. Width of corolla, length of style plus stigma, size of capsule, and width of raceme were measured on the fresh materials. Color of corolla, shape of leaf, hairiness and other characters were also observed. For this study, the plants cultivated from the seeds which had been obtained from the collections were also used.

Table 1. Species examined, voucher specimens and chromosome numbers

Species	Localitiy (voucher specimens and their depositions)	Habitat	Chromosome number (2n)
Veronica anagallis-aquatica L.	Near Zhongxin Town, Zhongdian County,Diqing Zang Nationality Autonomous Prefecture,alt. 3,200 m. 迪慶蔵族自治州中甸県中甸県城付近 (Tanaka 6001; KUN, MAK)	Waterside of a brook	36
	Napa Hai, Zhongdian County, Diqing Zang Nationality Autonomous Prefecture, alt. 3,190 m. 迪慶蔵族自治州中甸県納帕海 (Tanaka 6002; KUN, MAK)	Ditch along a path	36
	Xiao Zhongdian, Zhongdian County, Diqing Zang Nationality Autonomous Prefecture, alt. 2,970 m. 迪慶蔵族自治州中甸県小中甸 (Tanaka 6003; KUN, MAK)	Puddle in a mountain trail	36
	Yu Feng Temple, Lijiang Naxi Nationality Autonomous County, alt. 2,660 m. 麗江納西族自治県玉峰寺 (Tanaka 6004; KUN, MAK)	Ditch in the temple	36
Veronica undulata Wall.	Jianchuan County, Dali Bai Nationality Autonomous Prefecture, alt. 2,115 m. 大理白族自治州剣川県 (Tanaka 6005; KUN, MAK)	Puddle in an open space	54
	Tiger Leaping Gorge, Zhongdian County, Diqing Zang Nationality Autonomous Prefecture, alt. 1,840 m. 迪慶蔵族自治州中甸県虎跳峡 (Tanaka 6006; KUN, MAK)	Ditch along a path	54
	Midu County, Dali Bai Nationality Autonomous Prefecture, alt. 1,735 m. 大理白族自治州弥渡県 (Tanaka 6007; KUN, MAK)	Verge of a rice field	54
Veronica × *myrianthza* Tos.Tanaka	Between town area and Wen Bi Feng, Lijiang Naxi Nationality Autonomous County, alt. 2,325 m. 麗江納西族自治県市街と文筆峰の間 (Tanaka 6008; KUN, MAK)	Waterside of a brook	45

Results and Discussion

The somatic chromosome numbers of each plant are summarized in Table 1. As to chromosome numbers three types were observed in northwestern Yunnan Province, China.

The first type with 2n = 36 (tetraploid) (Fig. 1, A, A′) were collected at altitudes of above ca. 2,500 m. Their common characteristics are as follows: Leaf blade lanceolate-oblong or lanceolate, margin serrate, apex acute or acuminate. Glabrous or rarely sparsely glandlar-pubescent in the raceme. Corolla white, pale purple, or pale pink, 5–6 mm in diam. Style plus stigma 2.0–2.5 mm long. Capsule 3–4 mm long and wide. Ascending pedicel curved and thus making a narrow raceme, 10–15 mm wide. These characteristics well agree with the description of *Veronica anagallis-aquatica* L. in China (Li 1952, Tsoon and Hong 1979), North America (Hitchcock et al. 1959), and Europe (Hartl 1975). We conclude that the tetraploid is *V. anagallis-aquatica* L. (Fig.

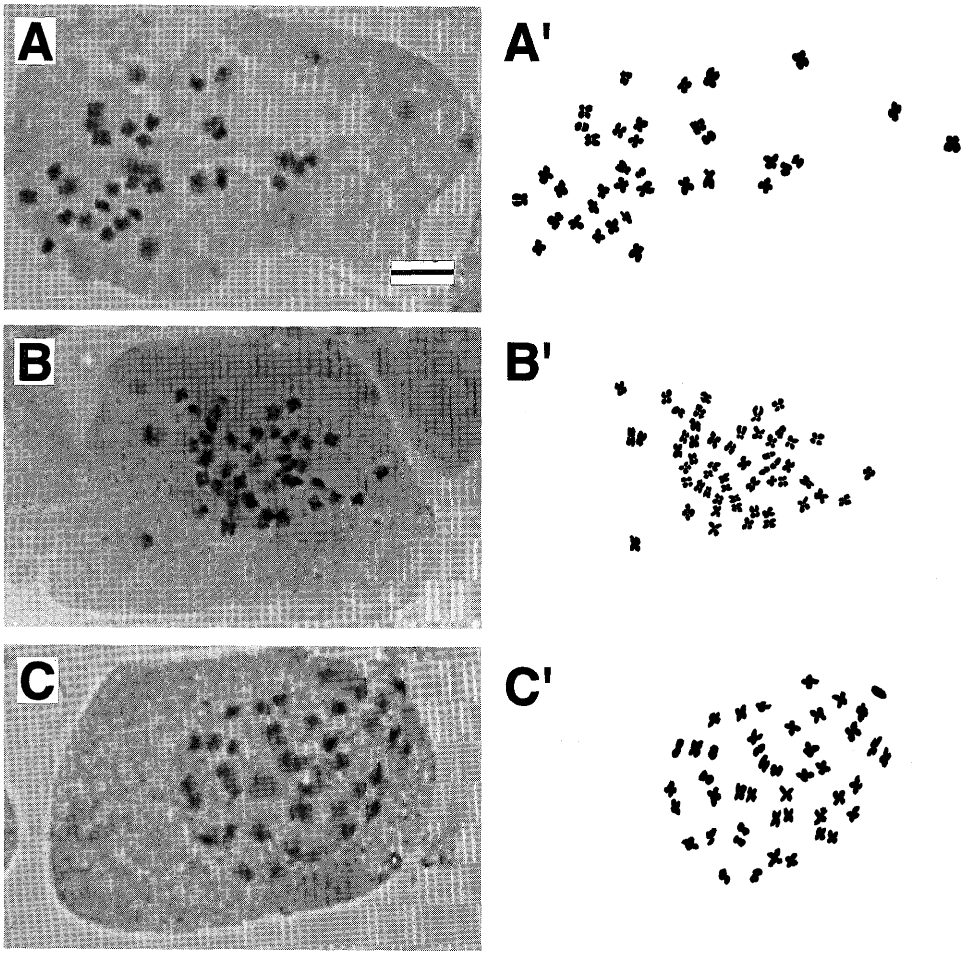


Fig. 1. Photomicrographs and drawings of metaphase chromosomes of *Veronica* Sect. Beccabunga from northwestern Yunnan Province, China. A and A′: *Veronica anagallis-aquatica* L. (2n = 36). (Tanaka 6002). B and B′: *Veronica undulata* Wall. (2n = 54). (Tanaka 6007). C and C′: *Veronica* × *myriantha* Tos. Tanaka (2n = 45). (Tanaka 6008). Scale bar indicates 5μm.

2). Although Pennell (1943), Li (1952), and Tsoon and Hong (1979) stated that width of the raceme of *V. anagallis-aquatica* was less than 1 cm wide, there were some cases where fruiting racemes were far exceeding 1 cm. In comparison with the plants outside Japan, *V. anagallis-aquatica* in Japan (Tanaka 1995) may be distinct in having wider and more purplish corolla and longer style. Moreover, *V. anagallis-aquatica* grows

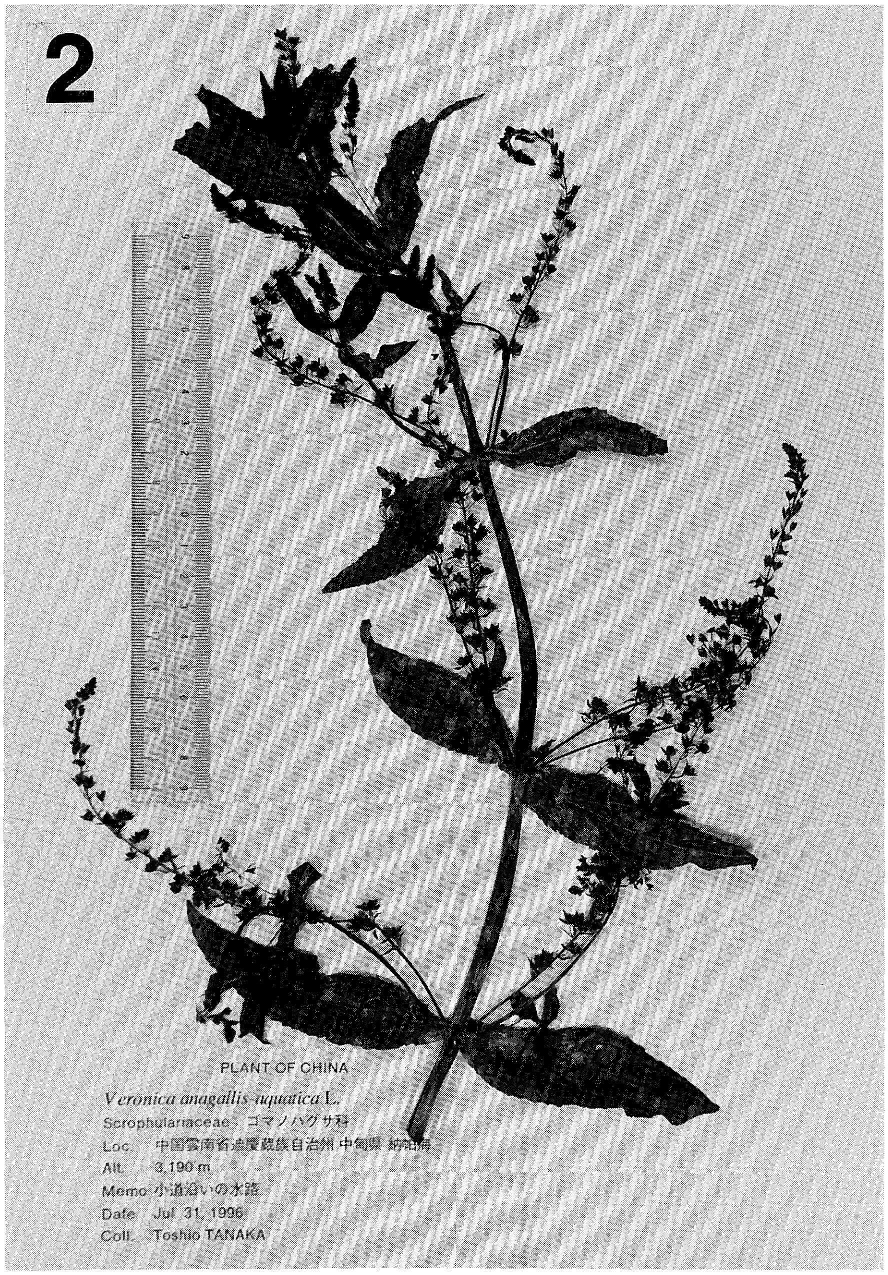
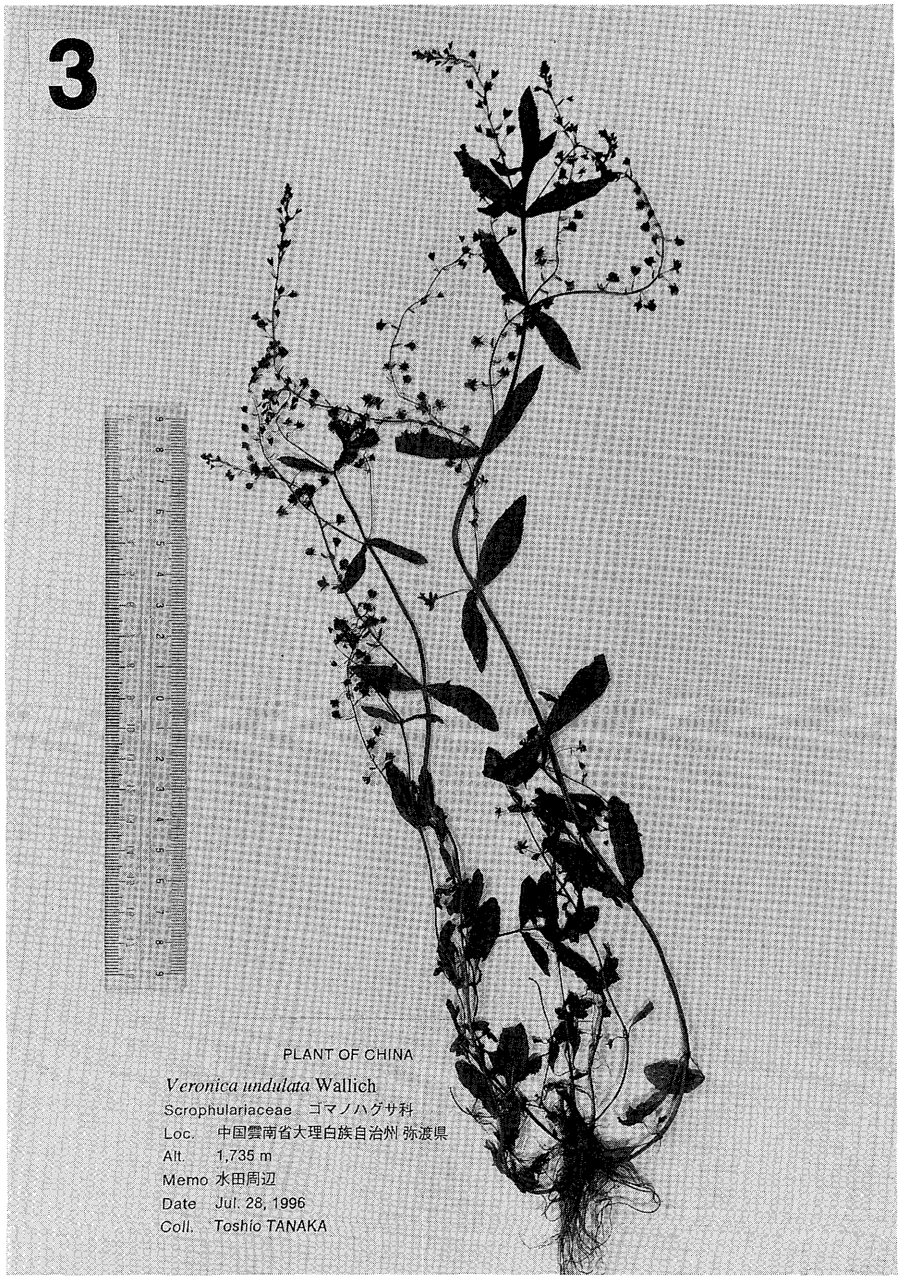

2
PLANT OF CHINA
Veronica anagallis-aquatica L.
Scrophulariaceae コマノハグサ科
Loc. 中国雲南省迪慶蔵族自治州 中甸県 納帕海
Alt. 3,190 m
Memo 小道沿いの水路
Date Jul. 31, 1996
Coll. Toshio TANAKA

Fig. 2. *Veronica* Sect. Beccabunga from northwestern Yunnan Province, China. *Veronica anagallis-aquatica* L. (Tanaka 6002).

at lower altitudes in Japan. In order to elucidate the relationship between *V. anagallis-aquatica* distributed in China and Japan, further studies are needed.

The second type with 2n = 54 (hexaploid) (Fig. 1, B, B′) were collected at altitudes of below ca. 2,500 m. The morphology of hexaploid is as follows: Leaf blade lanceolate, sometime lanceolate-oblong or narrow lanceolate, margin serrate, apex acute or obtuse. Glandlar-pubescent in the raceme. Corolla white or pale purple, 4–5 mm in



PLANT OF CHINA
Veronica undulata Wallich
Scrophulariaceae　ゴマノハグサ科
Loc.　中国雲南省大理白族自治州 弥渡県
Alt.　1,735 m
Memo 水田周辺
Date　Jul. 28, 1996
Coll.　Toshio TANAKA

Fig. 3.　*Veronica undulata* Wall. (Tanaka 6007).

diam. Style plus stigma 1.0–2.0 mm long. Capsule 3 mm long and wide. Pedicel spreading, usually distally upcurved, making a wide raceme, 13–18 mm wide. On the bases of these characteristics we conclude that the hexaploid is *Veronica undulata* Wall. (Fig. 3). Though *V. undulata* in China tends to have more sparsely arranged flowers in the raceme, it is generally similar to *V. undulata* found in Japan. The chromosome number of 2n = 54 in *V. undulata* is documented for the first time in China. On

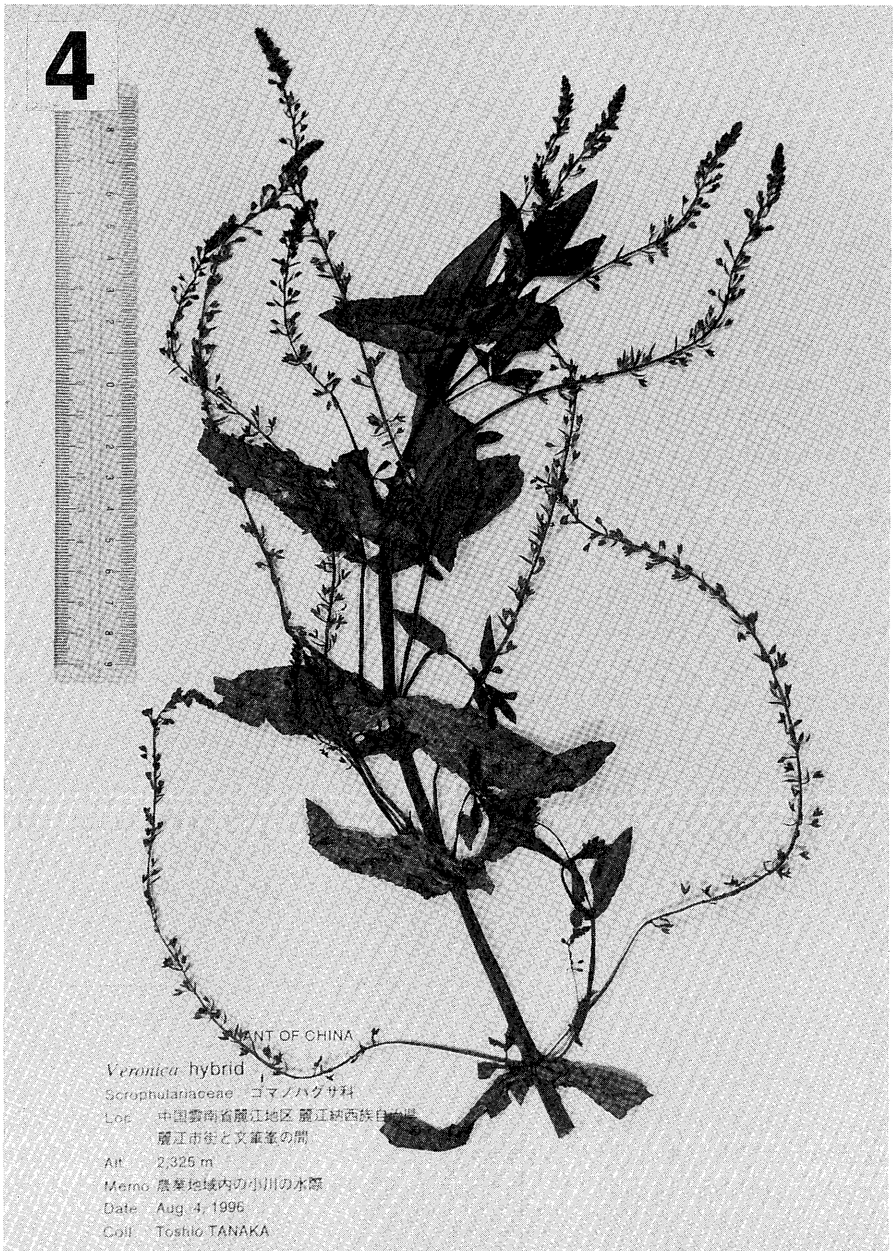


Fig. 4. *Veronica* × *myriantha* Tos. Tanaka (Tanaka 6008).

the other hand we could not collect the plant with 2n = 18 which was reported by Tsoon and Hong (1979). To obtain a clear picture of the forming process of polyploidy, a survey of *V. undulata* with 2n = 18 needs to be undertaken. The fact found in China that the plants growing at high altitudes and low altitudes are tetraploid and hexaploid, respectively, agrees with the situation found in *V. anagallis-aquatica* Complex in India (Khoshoo and Khushu 1966).

The third type with 2n = 45 (Fig. 1, C, C′) were collected at the waterside of the brook in the rice field, Lijiang. The long raceme was composed of many shriveled calyxes. The capsules were mostly aborted or scarcely seeded (Fig. 4). Such nature is characteristic of a hybrid. Judging from the chromosome number, we assume that this plant represents a natural hybrid between *V. anagallis-aquatica* and *V. undulata*, which has been reported previously from Japan as *Veronica* × *myriantha* Tos. Tanaka (Tanaka 1995). It is highly probable that the two putative mother species mentioned above are coexist at the collecting locality 2,325 m alt. This is the first record of a natural hybrid in *Veronica* Sect. Beccabunga from China.

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田中俊雄[a], 成　暁[b], 邑田　仁[c,*]: **中国雲南省で観察したゴマノハグサ科クワガタソウ属カワヂシャ節の植物**

中国雲南省において，ゴマノハグサ科クワガタソウ属カワヂシャ節の植物を調査をした．その結果，染色体数が異なる3種類の植物が観察された．高度が約2,500 mより高い4箇所で採集した個体は2n = 36であり，形態的な特徴は，中国植物誌（Tsoon and Hong 1979）や欧米のフロラ（Hartl 1975, Hitchcock et al. 1959）などに記載されている*Veronica anagallis-aquatica* L.とよく一致していた．これに対して，日本の平地に生育している*V. anagallis-aquatica*（Tanaka 1995）は，花冠の紫色がより濃い点や，花冠の直径や花柱の長さがより大きい点で異なり，本種全体から見れば，むしろ特殊な集団であると思われる．高度が約2,500 mより低い3箇所で採集した個体は2n = 54であり，カワヂシャ*Veronica undulata* Wall.とするのが妥当だと思われる．中国での2n = 54の記録はこれが最初である．日本で生育している*V. undulata*とは全体的によく似ていた．1箇所ではあるが，麗江地区の水田を流れる小川の水際において，2n = 45の染色体数の個体があった．外部形態は，極端に長い花序に不稔の花を多数つけており，雑種の特徴を示

していた．採集地点の高度は2,325 mであるので，上記で明らかとなった，2n = 36の*V. anagallis-aquatica*と2n = 54の*V. undulata*がともに生育している可能性があり，また，体細胞染色体数が45であることから判断して，この雑種は日本と同様に，これら2種を母種として形成された*Veronica* × *myriantha* Tos. Tanakaであると推定される．中国における雑種の報告はこれが最初である．

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